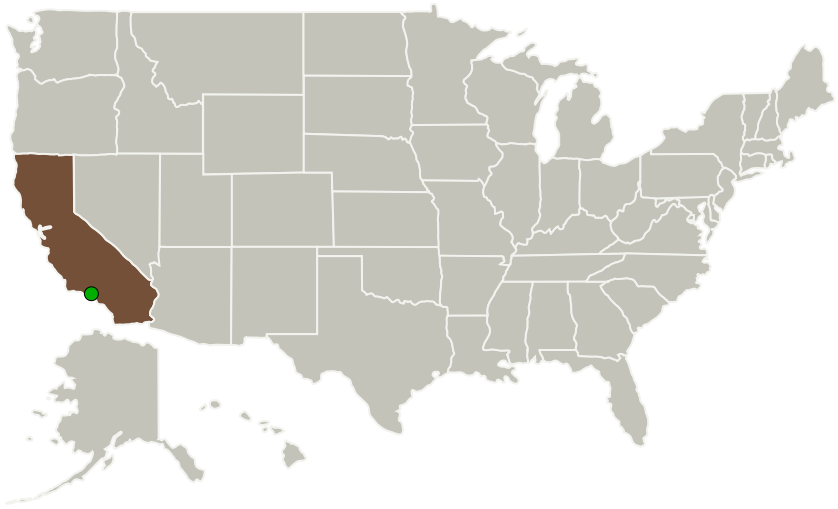
Terahertz Quantum Cascade Laser Local Oscillator, Phase I

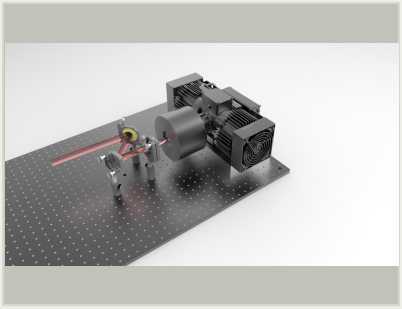
Completed Technology Project (2014 - 2014)

Project Introduction

NASA has a need for airborne or space-based observatories and remote sensors in order to penetrate the opaque atmosphere between 1 and 10 THz. For observations >2 THz, technologically mature microwave sources typically have microwatt power levels which are insufficient to act as LOs for a heterodyne receiver. LongWave Photonics is proposing to develop a compact, frequency agile, frequency locked, single mode quantum cascade laser (QCL) system. The distributed feedback grating (DFB) QCL arrays pack multiple devices on a single semiconductor die with individual devices lasing at different frequencies. The source will be frequency agile over 150 GHz with center frequencies ranging from 2 to 5 THz range. The DFB QCL array will be packaged in a high-reliability Stirling cycle cooler. The source will be frequency locked to a gas reference cell which has multiple absorption lines. The lines are much more closely spaced than the IF bandwidth of the detector, allowing continuous frequency coverage over the tunable range. Phase I LO power is expected to be > 1 mW with > 10 mW in Phase II. Methods for amplitude stabilization will be investigated.

Primary U.S. Work Locations and Key Partners





Terahertz Quantum Cascade Laser Local Oscillator Project Image

Table of Contents

Terahertz Quantum Cascade Laser Local Oscillator, Phase I

Completed Technology Project (2014 - 2014)

Organizations Performing Work	Role	Type	Location
LongWave Photonics, LLC	Lead Organization	Industry	Mountain View, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

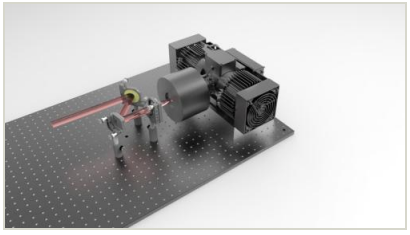
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139380)*

Images



Project Image
Terahertz Quantum Cascade Laser Local Oscillator Project Image *(https://techport.nasa.gov/image/135804)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
LongWave Photonics, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Alan W Lee

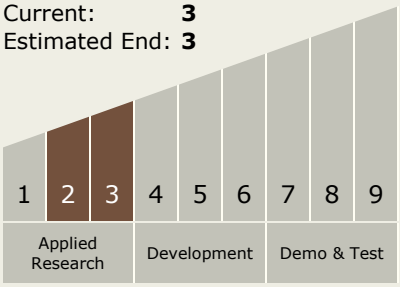
Co-Investigator:
Alan W Lee

Terahertz Quantum Cascade Laser Local Oscillator, Phase I

Completed Technology Project (2014 - 2014)

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System